# ANATOMY THEME SESSION: Oesophagus, Stomach, Small Intestine and Large Intestine

## AIM
To understand the general anatomy of oesophagus, stomach and small intestine and large intestine, their relationships to other viscera and to peritoneum.

## Learning Objectives
Students should be able to identify underlined structures and:

- To understand and describe the anatomy of the oesophagus, stomach, small intestines (duodenum, jejunum & ileum) and large intestine including relationships, neurovascular supply and lymphatic drainage.
- To understand the relationships of the rectum including the structures palpable in digital rectal examination
- To identify the oesophagus, stomach and intestines (small & large) on barium films, radiographs and CT scans.

## Lecturer Role

- Largely facilitatory: should NOT provide a mini-lecture to the students.
- When students first arrive, to orientate them to the notes and prosections relevant to the activity.
- To answer questions from students.

## Student Role

- View introductory DVD on the theme session website BEFORE attending the session.
- Make sure to identify all structures mentioned in the notes.
- To ask the tutor questions, but do NOT expect a mini-lecture on the topic.
- Attempt the quiz on the theme session website.

This material has been modified from Sydney Medical Program for teaching purposes of the University of Malaya Medical Program (UMMP) by the Department of Anatomy, Faculty of Medicine, University of Malaya.
**ACTIVITY 1 – Oesophagus**

1. **Oesophagus in neck.** Identify the **pharynx**, **cricopharyngeus muscle** (upper oesophageal sphincter) and **oesophagus**. At what vertebral level does the pharynx become continuous with the oesophagus?

2. **Oesophagus in thoracic cavity.** On models and prosections *identify* the **oesophagus** in the thoracic cavity. Observe the **relationships** of the oesophagus. Identify the **left and right vagus nerves** forming the **oesophageal plexus** below the level of the tracheal bifurcation. On **barium swallows**, identify the **constrictions** produced by the aortic arch / L. main bronchus and diaphragm.

3. **Oesophagus in abdominal cavity.** Find the **oesophageal hiatus** in the diaphragm and the short course of the **oesophagus in the abdominal cavity**. At what vertebral level does the oesophagus pass through the diaphragm (*hint* – how many letters in the word oesophagus)? At what vertebral level does it join the stomach?

4. **Blood and nerve supply.** Understand the portosystemic anastomosis of veins at the lower part of the esophagus? What will occur here with portal hypertension?

**ACTIVITY 2 – Stomach**

1. **Stomach.** On an isolated stomach, *identify* **curvatures**, **notches**, **surfaces**, 4 parts (cardia, fundus, body, pyloric part), **orifices**, **pyloric sphincter** and **rugae**.

2. **Stomach and its relationships.** On models and prosections *identify* the **abdominal part of the oesophagus and stomach**. Name the structures that lie posterior to the stomach (diaphragm, L. suprarenal, L. kidney, pancreas, transverse colon & transverse mesocolon, spleen) and anterior to the stomach (liver, diaphragm, anterior abdominal wall).

3. **Peritoneal relationships.** *Identify* the **greater omentum**, **lesser omentum**, **epiploic foramen** and **lesser sac** (omental bursa). What structures are separated from the stomach by the lesser sac?

4. **Blood supply.** Identify the coeliac trunk and its branches that supply the stomach. Apart from the stomach, what other structure does the L. gastric artery supply?
   - What artery is in danger from erosion of a gastric ulcer (through the posterior wall of the stomach)?
5. Label the diagram.

ACTIVITY 3 – Small Intestine

➢ **Duodenum**

1. **Duodenum.** On prosections of the duodenum and pancreas, *identify* the 4 parts of the duodenum (superior, descending, horizontal/inferior, ascending), and the greater and lesser duodenal papillae. *Name* the ducts that drain into the duodenum at these papillae?

2. **Relationships.** Take note of the relationships of the duodenum and its parts on prosections. Where would you look for the suspensory ligament of the duodenum (ligament of Treitz)?

3. **Blood supply.** *Describe* the blood supply to the duodenum. *Identify* the gastroduodenal artery and superior mesenteric artery.
   - What artery is in danger from erosion of an ulcer through the posterior wall of the superior part (first part) of the duodenum?

➢ **Jejunum - ileum**

4. **Jejunum-ileum.** On abdominal prosections *identify* the jejunum and ileum, which are suspended by the mesentery. *Roll* the proximal jejunum then distal ileum between your fingers and notice the difference in thickness. *Trace* the mesentery back to its attachment to the posterior abdominal wall – this attachment point is called the root of the mesentery. *Describe* the location and length of the root of the mesentery.

5. On isolated viscera, the jejunum is distinguished by fat-free windows between vasa recta in the mesentery near the gut wall as opposed to fat encroaching onto the wall of the ileum. *Note* the presence of Peyer’s patches on the antimesenteric border of the ileum which are often difficult to see on prosections. What does the word antimesenteric mean?

6. **Blood supply.** *Identify* the superior mesenteric artery. If light is shone through the mesentery, how would you describe the appearance of the arterial arcades and vasa recta. What are the difference in these between jejunum and ileum?
ACTIVITY 4 – Large Intestine

- Caecum, Appendix and Colon

1. On models and prosections, identify the distal ileum, caecum and vermiform appendix and its mesoappendix, the ascending, transverse, descending and sigmoid colon and colic flexures. Observe how the 3 taeniae coli converge on the appendix. Internally identify the ileocaecal valve and orifice of the appendix. Identify the transverse mesocolon and sigmoid mesocolon. Realise that the ascending and descending colon are most commonly retroperitoneal and identify the left and right paracolic gutters if visible on prosections. Differentiate colon from small intestine, based on the presence of haustrations, taeniae coli and appendices epiploicae on the colon (absent on small intestine).

2. Blood supply. Label the structures in the diagram below. Indicate the superior and inferior mesenteric arteries and state the parts of the gastrointestinal tract supplied by each.

- Rectum and Anal Canal

1. On sagittal models of the male and female pelvis, identify sigmoid colon, rectum (commencing anterior to SV3), anal canal, anus, internal and external anal sphincters. Identify the rectovesical pouch (in male) and rectouterine pouch (in female). Identify these same structures where possible on isolated specimens of rectum & anal canal.
   - Where is the pectinate line and what is the significance of this ‘line’ with respect to embryological origin of the lining tissue, blood supply, lymphatic drainage and pain?

2. Peritoneal pouches. On superficial abdominal prosections, place your fingers into the
rectouterine pouch (of Douglas) in the female and rectovesical pouch in the male. Note
the variation in depth between different individuals.

3. **Relationships.** State the relationships of the rectum (see appendix) and note these on the
prosections and models. What structures are palpable during a digital rectal examination?

**ACTIVITY 4 – Imaging**

1. On **barium meals**, identify proximal oesophagus, stomach, pyloris, duodenum and jejun-
   ileum.

2. On upright chest X-rays, **identify gas in the fundus of the stomach. Identify the stomach**
on CTs.

3. On plain abdominal films, **identify gas in the colon. On barium enemas identify parts of the**
   **large intestine** haustrations of the colon (most marked on proximal large intestine).
APPENDIX 1: RELATIONSHIPS OF VISCERA

Relationships in textbooks differ slightly. The standard reference used here is Gray’s Anatomy, 38th edition. Note that the list below is selective (not every structure is included). These relationships are not meant to be memorized but to be understood. The best way to learn these relationships during private study is to use texts and atlases and to develop your own sketches.

Oesophagus
Anterior: trachea (C6-TV4/5), left principal bronchus, heart and pericardium (enlargement of L. atrium of heart may cause dysphagia).
Posterior: in upper 2/3 - vertebral bodies, then descending thoracic aorta. Crossing behind it are the thoracic duct (~TV5) and hemiazygos veins
Constrictions (distance from incisor teeth):
- upper oesophageal sphincter (15cm);
- arch of aorta (22cm);
- left principal bronchus (27cm);
- oesophageal hiatus in diaphragm (40cm).

Stomach
Anterior: liver, diaphragm, anterior abdominal wall
Posterior (Stomach bed):
- through the lesser sac related to the diaphragm, left kidney and suprarenal gland, pancreas (and splenic artery), transverse mesocolon;
- through the greater sac, the stomach is related to the spleen
Peritoneal relationships:
- anterior and posterior surfaces covered by peritoneum
- greater and lesser omenta attach to greater and lesser curvatures respectively

Duodenum
Visceral relationships.
Parts 1-3: head of pancreas,
Part 4: body of pancreas
Part 1: Posterior: bile duct and portal vein and gastroduodenal artery,

Anterior: gallbladder (in front and above)

Part 2: Posterior: hilum of right kidney and its vessels

Anterior: liver, gallbladder, transverse colon and small intestine (jejunum),

Medial: bile duct and pancreatic ducts and head of pancreas

Part 3: Posterior: right ureter, psoas, IVC and aorta

Anterior: small intestine and superior mesenteric vessels

Part 4: Posterior: left psoas

Anterior: transverse colon
RECTUM

Posterior: sacrum and coccyx
Anterior: Upper part both sexes: coils of sigmoid colon and ileum
Lower part Male: rectovesical pouch, bladder, prostate, seminal vesicles, ductus deferens (ampulla), membranous urethra, bulb of penis
Female: rectouterine pouch, uterus and vagina
Later: Upper part coils of ileum and sigmoid colon
Lower part pelvic diaphragm, inferior hypogastric plexus, ischial spine, (ischial tuberosity).

*Pathological changes involving the ovaries, uterine tubes and vermiform appendix can also be detected on a digital rectal examination.

APPENDIX 2: RELATIONSHIPS OF VISCERA TO PERITONEUM

RETROPERITONEAL VISCERA: Kidneys, ureters, suprarenal glands, duodenum (except first few cms), pancreas (except tail), ascending colon, descending colon, rectum (upper part; lower part is not related to peritoneum)

INTRAPERITONEAL VISCERA: Stomach, jejunum, ileum, caecum, vermiform appendix, transverse colon, sigmoid colon, liver, spleen